

What is claimed is:

1. A multistage gear pump for pressurizing fluid, comprising:

a housing;

5 a drive shaft rotatably supported in the housing; and

a gear assembly disposed in the housing, the gear assembly including

at least first and second gear trains, each train having a pair of drive and driven

gears that are engaged with each other, the drive gear being provided on the

drive shaft and followed by the driven gear, the first gear train and the second

10 gear train being arranged so that fluid sequentially passes therethrough as the

drive shaft rotates, wherein a theoretical discharge capacity of the first gear train

is larger than that of the second gear train.

2. The multistage gear pump according to claim 1, wherein the first gear

15 train has a first facewidth and the second gear train has a second facewidth that

is smaller than the first facewidth, thereby the theoretical discharge capacity of

the second gear train is set to be smaller than that of the first gear train.

3. The multistage gear pump according to claim 1, wherein the theoretical

20 discharge capacity of the second gear train is set to be equal to an actual

discharge capacity of the first gear train by considering a leak rate of the fluid.

4. The multistage gear pump according to claim 3, wherein the actual discharge capacity of the first gear is determined to be 70 to 80 percentage of the theoretical discharge capacity of the first gear train.

5 5. The multistage gear pump according to claim 3, wherein the theoretical discharge capacity of the second gear train is equal to the actual discharge capacity of the first gear train with a slight tolerance.

6. The multistage gear pump according to claim 5, wherein a maximum
10 tolerance is 10 percentage of the theoretical discharge capacity of the first gear train.

7. The multistage gear pump according to claim 6, wherein the maximum
tolerance is 5 percentage of the theoretical discharge capacity of the first gear
15 train.

8. The multistage gear pump according to claim 1, wherein a valve means
is provided on a passage that interconnects the second gear train with the first
gear train, the valve means opening so as to discharge the fluid in the passage by
20 bypassing the second gear train when a pressure of the fluid in the passage
exceeding a predetermined pressure.

9. The multistage gear pump according to claim 1, further comprising a driven shaft, the driven gears being connected to the driven shaft, one of the driven gears being formed integrally with the driven shaft, the rest of the driven gears being rotatable relative to the driven shaft.

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10. The multistage gear pump according to claim 9, wherein the first gear train has a first facewidth and the second gear train has a second facewidth that is smaller than the first facewidth, the driven gear constituting the gear train whose pressure is the highest of the gear trains being formed integrally with the driven shaft.

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11. The multistage gear pump according to claim 9, wherein the first gear train has a first facewidth and the second gear train has a second facewidth that is smaller than the first facewidth, the driven gear which is formed integrally with the driven shaft constituting a first gear train through which the fluid is passed firstly.

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12. The multistage gear pump according to claim 1, wherein the fluid is dimethylether.

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13. The multistage gear pump according to claim 1, wherein the fluid has at least one of low viscosity characteristics and easily vaporized characteristics in a

liquid state.

14. A multistage gear pump for pressurizing fluid, comprising:

a housing;

5 a drive shaft rotatably supported in the housing;

a driven shaft rotatably supported in the housing; and

a gear assembly disposed in the housing, the gear assembly including
at least first and second gear trains, each train having a pair of drive and driven
gears that are engaged with each other, the drive gear being provided on the
10 drive shaft and followed by the driven gear, the first gear train and the second
gear train being arranged so that fluid sequentially passes therethrough as the
drive shaft rotates, wherein one of the driven gears is formed with the driven shaft
so as to rotate integrally with the driven shaft, the rest of the driven gears being
assembled to the driven shaft so as to rotate relative to the driven shaft.

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15. The multistage gear pump according to claim 14, wherein the driven
gear that is rotatable integrally with the driven shaft is formed integrally with the
driven shaft.

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16. The multistage gear pump according to claim 15, wherein the facewidths
of the gear trains are different from each other, the driven gear which is formed
integrally with the driven shaft constituting a gear train that has a smallest

facewidth.

17. The multistage gear pump according to claim 15, wherein the facewidths of the gear trains are different from each other, the driven gear which is formed
5 integrally with the driven shaft constituting a gear train that has a largest facewidth.